

CLAIMS

1. A hollow structure plate formed by fusing a plurality of hollow protrusions that are projected in each of two thermoplastic resin sheets with the hollow protrusions facing against one another,

wherein said hollow protrusions are truncated cone-shaped,

wherein a ratio of a total area of a lower base of each of said hollow protrusions to an area of a circumferential surface is in a range from 0.3 to 0.9, and

wherein a rising angle of a side face of each of said hollow protrusions in a vertical plane including a central axis of the hollow protrusion is in a range from 50 degrees to 70 degrees.

2. A method for manufacturing a hollow structure plate comprising:

introducing two thermoplastic resin sheets into a pressure-reduced chamber;

attracting and attaching the resin sheets respectively to a circumferential surface of each of a pair of upper and lower emboss rollers that are arranged rotatably in said pressure-reduced chamber to form a multitude of hollow protrusions on each of the resin sheets in accordance with a shape of a pin projected in each of the emboss rollers; and

thermally fusing the end faces of said hollow protrusions in a position of a contact line of the emboss rollers continuously;

wherein introduction guides are arranged respectively above and below a sheet-introducing opening portion of said pressure-reduced chamber, each of said introduction guides being inclined toward a direction of the contact line of each of the

emboss rollers;

wherein heating means for thermal fusion is provided between the introduction guides, said heating means being arranged in a non-contact manner between said resin sheets; and

5 wherein each of said resin sheets is attracted and attached respectively to the circumferential surface of each of the emboss rollers under a reduced pressure by maintaining opposing surfaces of said resin sheets in said pressure-reduced chamber at an atmospheric pressure and reducing a pressure at surfaces opposite
10 therefrom.

3. A method for manufacturing a hollow structure plate according to claim 2, wherein means for inserting and guiding laterally-opposite side portions of each of said resin sheets
15 along opposite side portions of said emboss rollers is provided.

4. A method for manufacturing a hollow structure plate according to claim 2 or 3, wherein a surface material is laminated on an upper and a lower surface of the hollow structure plate
20 subsequently after the hollow structure plate is molded.

5. A method for manufacturing a hollow structure plate comprising:

25 introducing two thermoplastic resin sheets into a pressure-reduced chamber;

30 attracting and attaching the resin sheets respectively to a circumferential surface of each of a pair of upper and lower emboss rollers that are arranged rotatably in said pressure-reduced chamber to form a multitude of hollow protrusions on each of the resin sheets in accordance with a shape

of a pin projected in each of the emboss rollers; and

thermally fusing the end faces of said hollow protrusions in a position of a contact line of the emboss rollers continuously;

wherein the emboss rollers satisfying the following
5 conditions are used:

said pin is truncated cone-shaped;

a ratio of a total area of a lower base of the pin to an area of the circumferential surface of said emboss roller is in a range from 0.3 to 0.9; and

10 a rising angle of a side face of the pin in a vertical plane including a central axis of the pin is in a range from 50 degrees to 70 degrees.

6. An apparatus for manufacturing a hollow structure plate
15 comprising:

a pressure-reduced chamber that is evacuated to reduce a pressure inside;

a pair of upper and lower emboss rollers that are supported with bearings rotatably in said pressure-reduced chamber in a
20 state in which circumferential surfaces of the rollers face a front opening portion of said pressure-reduced chamber, a pin provided on one of the rollers being brought into contact with a pin provided on the other via a resin sheet in a position of a contact line;

sheet-introduction plates that are arranged respectively
25 above and below said front opening portion, each of said sheet-introduction plates being inclined toward a direction of the contact line of each of said emboss rollers;

a plurality of border rollers that are supported rotatably on an inner side of opposite side portions of said pressure-reduced
30 chamber;

a pair of border-roller receiving and quasi-sealing members that are opposed respectively to said border rollers with a small gap therebetween and that are arranged on both sides of each of the emboss rollers to quasi-seal both sides of said emboss roller in said pressure-reduced chamber;

rear plates that are continuous toward a rear opening portion of said pressure-reduced chamber, each of said rear plates being arranged horizontally toward a direction of the contact line of each of said emboss rollers on the rear side thereof; and

a heater for heating that is arranged between said introduction plates.

7. An apparatus for manufacturing a hollow structure plate comprising:

a pressure-reduced chamber that is evacuated to reduce a pressure inside;

a pair of upper and lower emboss rollers that are supported with bearings rotatably in said pressure-reduced chamber in a state in which circumferential surfaces of the rollers face a front opening portion of said pressure-reduced chamber, a pin provided on one of the rollers being brought into contact with a pin provided on the other via two thermoplastic resin sheets in a position of a contact line; and

a heater for heating that is arranged at said front opening portion;

wherein said pin of each of said emboss rollers is truncated cone-shaped;

wherein a ratio of a total area of a lower base of the pin to an area of the circumferential surface of said emboss roller is in a range from 0.3 to 0.9; and

wherein a rising angle of a side face of the pin in a vertical plane including a central axis of the pin is in a range from 50 degrees to 70 degrees.

- 5 8. A sound absorbing structure plate comprising
a hollow structure plate constituted by attaching
non-air-permeable sheets onto front and back sides of a core member
obtained by fusing a plurality of hollow protrusions that are
projected in each of two thermoplastic resin sheets with the hollow
10 protrusions facing against one another,

wherein a small hole opened between the hollow protrusions
on at least one of the front and back sides of said hollow structure
plate is formed.

- 15 9. A sound absorbing structure plate according to claim 8,
wherein a sound absorbing material is attached onto the side on
which the small hole is formed in said hollow structure plate.

10. A sound absorbing structure plate according to claim 8 or
20 9, wherein said hollow structure plate has a Metsuke of from 700
to 3000 g/m².